

## Clinical Relevance for the Veteran

### SUMMARIES OF SCIENTIFIC/TECHNICAL ARTICLES

#### **A cost-utility analysis of adult group audiologic rehabilitation: Are the benefits worth the cost?**

Harvey Abrams, PhD; Theresa Hnath Chisolm, PhD;  
Rachel McArdle, MS

**Purpose of the Work.** The purpose of this work was to compare the cost-effectiveness of two treatment approaches: (1) hearing aid use alone (HA) and (2) hearing aid use with group post-fitting audiologic rehabilitation (HA + AR). **Subjects and Procedures.** A total of 105 veterans, 67 males and 38 females, participated in this study. The MOS-SF36V was administered before and after treatment to determine if and how much quality of life changed as a result of participating in the HA or HA + AR intervention. The cost associated with each treatment method was also analyzed. **Results.** Participants in both treatment groups exhibited a statistically significant improvement in the MOS-SF36V. The results of a cost-utility analysis revealed that HA + AR was the more cost-effective treatment. **Relevance to the Veteran Population.** The results of this study indicated that, while the use of hearing aids improved quality of life at a relatively low cost, adding an AR component improved outcome and reduced the cost per quality adjusted life years gained.

*Harvey Abrams, PhD*

#### **Time-expanded speech and speech recognition in older adults**

Nancy E. Vaughan, PhD; Izumi Furukawa, MA;  
Nirmala Balasingam, MSEE; Margaret Mortz, PhD;  
Stephen A. Fausti, PhD

**Purpose of the Work.** Speech that is either too fast or too noisy is more difficult for older adults to understand than for younger adults. It has been shown that a technique of communication called clear speech (which includes, but is not limited to, slowing the rate of speech) can significantly improve speech recognition of older adults. The purpose of this study was to investigate the effects of a nonuniform time-expansion algorithm on speech recognition in older adults. **Subjects and/or Procedures.** Eighteen adults in each of three groups were tested at two rates

of time-expanded speech. A younger adult group and an older adult group had normal bilateral hearing, and one older group had mild to moderate sensorineural hearing loss. The task was to repeat sentences from the Connected Speech Test that had been processed by a nonuniform time-compression algorithm. The task was performed in noise and in quiet. Group scores were compared with the use of key word scoring. **Results.** All three groups performed better on sentence recognition tests with unprocessed (normal) speech. The effects of noise were equally detrimental to both older groups. In noise, slowing the speech rate to a greater degree was more effective, but in quiet, too much slowing had an adverse effect on speech recognition across all groups. **Relevance to the Veteran Population.** This research will lead to new methods of processing speech for better understanding for older adults. Older veterans and other individuals for whom hearing aids are not sufficient to improve speech understanding will benefit from this research.

*Nancy E. Vaughan, PhD*

#### **An efficient test protocol for identification of a limited, sensitive frequency test range for early detection of ototoxicity**

Nancy E. Vaughan, PhD; Stephen A. Fausti, PhD;  
Stephen Chelius, MCD; David Phillips, PhD;  
Wendy Helt, MA; James A. Henry, PhD

**Purpose of the Work.** Behavioral audiometric testing of the full range of frequencies (2 kHz through 20 kHz) for early detection and monitoring of ototoxicity is a time-consuming and labor-intensive clinical procedure. Ill patients receiving ototoxic drugs can find such testing tiring and stressful. If a patient's sensitive range of ototoxicity (SRO) could be determined with a shorter testing protocol, baseline test times could be significantly reduced. Our purpose of this study was to evaluate a technique to rapidly identify an individualized SRO to develop an efficient clinical protocol for early identification of ototoxicity. **Subjects and/or Procedures.** We tested hospitalized males ages 43 to 79 years who were not receiving any medications known to be ototoxic with two behavioral protocols: a full-frequency (2 kHz to 20 kHz) baseline audiometric test using standard clinical protocol and a rapid identification protocol to identify the highest frequency at which a threshold could be obtained at or below

100 dB SPL. The SRO was then established based on that target frequency. **Results.** The shortened rapid identification protocol identified the same uppermost target frequency as the full frequency protocol in the majority of patients (87%). Where differences occurred, target frequencies obtained by the two methods did not differ by more than one-half octave. **Relevance to the Veteran Population.** The population of veterans across the Department of Veterans hospital system who are receiving ototoxic medications can benefit from early detection of ototoxicity in the high frequencies before the effects spread to other frequencies that affect the ability to understand speech.

*Nancy E. Vaughan, PhD*

#### **A structured educational model to improve pressure ulcer prevention knowledge in veterans with spinal cord dysfunction**

Susan L. Garber, MA, OTR, FAOTA;

Diana H. Rintala, PhD; Sally Ann Holmes, MD;

Gladys P. Rodriguez, PhD; Jeffrey Friedman, MD

**Purpose of the Work.** The purpose of this study was to determine the effect of education and structured follow-up on knowledge of pressure ulcers in veterans with spinal cord dysfunction after pressure ulcer surgery. **Subjects and/or Procedures.** Forty-one males with SCI or MS were randomized before surgery to either an intervention or a control group. A test on knowledge of pressure ulcer prevention was administered before surgery and at discharge from the hospital. The intervention group received 4 hours of structured, individualized pressure ulcer prevention education during hospitalization. The control group received standard education. **Results.** The intervention group gained more knowledge than did the control group. Lower discharge knowledge scores were related to older age, older age at onset of SCI, a greater number of previous pressure ulcer surgeries, and nonbelief that daily skin checks make “a lot” of difference in whether one gets ulcers. **Relevance to the Veteran Population.** Pressure ulcers are a severe, costly, and potentially life-long complication of SCI that interfere with every aspect of life. This study demonstrated that enhanced, individualized education was effective in improving pressure ulcer knowledge.

*Susan L. Garber, MA, OTR, FAOTA*

#### **Depressive symptoms and independence in BADL and IADL**

Sue-Min Lai, PhD, MS, MBA; Pamela W. Duncan, PhD, FAPTA; John Keighley, MS; Dallas Johnson, PhD

**Purpose of the Work.** This study examined the relationship between depressive symptoms and time courses in achieving independence in basic activities of daily living (BADL) and instrumental activities of daily living (IADL). **Subjects and/or Procedures.** Prospectively, 459 stroke patients were assessed at baseline and at 1, 3, and 6 months after stroke. The Geriatric Depression Scale was used to determine depressive status. Outcomes were times to achieve independence in BADL and independence in at least three IADL. **Results.** Depressed patients were 0.3 times less likely than nondepressed patients to achieve independence in BADL and 0.4 times less likely to be independent in three or more IADL. The cumulative percentages of patients achieving independence in BADL at 1, 3, and 6 months after stroke were 47%, 63%, and 72% for nondepressed and 19%, 34%, and 52% for the depressed patients, respectively. Similarly, the cumulative percentages for patients to achieve complete independence in three or more IADLs at 1, 3, and 6 months after stroke were 56%, 72%, and 85% for nondepressed and 32%, 47%, and 72% for the depressed patients. Depressed patients had poorer recovery patterns and took longer to achieve the outcomes. **Relevance to the Veteran Population.** Stroke patients with depressive symptoms progressed slower in achieving independence of BADL and IADL compared to patients without depressive symptoms. By recognizing these poststroke symptoms of depression, clinicians can treat the veteran population of stroke survivors more quickly to overcome their depression and achieve independence in both activities of daily living.

*Sue-Min Lai, PhD, MS, MBA*

#### **Investigation of lower-limb tissue perfusion during loading**

M.B. Silver-Thorn, PhD

**Purpose of the Work.** The purpose of this study was to modify an existing research tool used to measure the mechanical response of human soft tissue to load, to include measures of tissue perfusion. **Subjects and/or Procedures.** Tests were conducted on the posterior calf of

19 healthy subjects to demonstrate the utility of the device and identify potential measures of interest. **Results.** In addition to these preliminary studies demonstrating the utility of the modified device, the tests identified several potential perfusion measures that may assist future evaluation of prosthetic fit and dermatological risk for lower-limb amputees and individuals with peripheral vascular disease. These measures include the loading and recovery delays during cyclic loading, the time for the tissue perfusion to equilibrate during relaxation and creep loading, and the magnitude of the perfusion response during cyclic, relaxation, and creep loading. **Relevance to the Veteran Population.** The identification and subsequent measurement of tissue perfusion measures during loading to help evaluate prosthetic fit and/or dermatological risk may assist veterans with lower-limb amputation and/or peripheral vascular disease.

*M.B. Silver-Thorn, PhD*

#### **Processing computer tomography bone data for prosthetic finite element modeling:**

##### **A technical note**

Rakesh Saxena, PhD; Santosh G. Zachariah, PhD;  
Joan E. Sanders, PhD

**Purpose of the Work.** This study seeks to build accurate three-dimensional (3D) models of the bones within the lower limb using existing X-ray computer tomography (CT) scans. **Subjects, Procedures, and Results.** One male amputee volunteer was CT scanned and a 3D model of his tibia (shinbone) created. **Discussion.** The methods overcome existing difficulties in creating shape models from CT scans, are rapid, and can process CT scans from different individuals. **Relevance to the Veteran Population.** Currently, CAD/CAM (computer-aided design/computer-aided manufacturing) computer programs use the shape of the residual limb to aid prosthetists in fabricating

the prosthetic socket. Addition of display of the shapes of the bones could provide additional useful information to enhance the quality and fit of the prosthesis. In the future, the shape models could be converted into computational engineering models to predict interface pressures and shears for proposed socket designs, information that would further enhance fitting.

*Joan E. Sanders, PhD*

#### **Footwear used by individuals with diabetes and a history of foot ulcer**

Gayle E. Reiber, MPH, PhD; Douglas G. Smith, MD; Carolyn M. Wallace, PhD; Christy A. Vath, BS; Katrina Sullivan, DPM; Shane Hayes, CPed; Onchee Yu, MS; Don Martin, PhD; Matthew Maciejewski, PhD

**Purpose of the Work.** This study describes the footwear preferences of people with diabetes and a history of foot ulcers from two large western Washington State health-care organizations. **Subjects and/or Procedures.** Participants reported their footwear preferences; use of optimal, adequate, and dangerous types of footwear; and the cost of footwear used during the year prior to study enrollment. **Results.** Women spent an average of 51% of their time in shoes in dangerous shoes compared to 27% in men. Men and women spent nearly 30% of their time while out of bed in slippers, stockings, and barefeet. **Relevance to the Veteran Population.** Providing patients with information on good footwear choices may help them select adequate shoes while avoiding dangerous shoes. Encouraging widespread use of adequate footwear is a more realistic approach than trying to move all persons with prior foot risk factors or ulcers into uniformly optimal footwear.

*Gayle E. Reiber, MPH, PhD*

